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A RECONSTRUCTION OF CHICK EMBRYOS' OPTIC CUP AND A STUDY ON THE DISTRIBUTION OF MITOTIC FIGURES AT 13th AND 17th STAGES

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ABSTRACT

The present work describes the results of the study of mitotic figures in developing optic cup of chick embryos. The cups were divided into sectors and in each sector the interphases, mitotic indices and indices of mitotic phases were analysed. In the paper there is a description of the values found which show the relationship between the results and peculiarities of the developing optic cup where the structure shows differences such as for instance the choroid fissure.

INTRODUCTION

The development and differentiation of the retina have called the attention of many authors (Mann,1921; Hamburger and Hamilton,1951; Silver and Sidman,1980), the relationship between the time of differentiation of the neuroblasts and the particular situation on the diverse development stages (Langman, 1956; O'Rahilly and Meyer, 1958, and Almendros et al., 1982).

Former studies carried out by our Department (Abadía-Fenoll et al., 1982) and set forth in previous Congresses detected differences in the total of the prophases and metaphases when comparing different developing optic cups of the chick. Starting

from these data we have now wanted to analyse the mitotic distribution in the several parts of the optic cup.

MATERIAL AND METHODS

In order to carry out the study we employed ten optic cups which amounted to a total of some 500 sections for observation. The embryos were fixed in a mixture of glutaraldehyde 2%, formaldehyde 2%, buffered at pH 7.2. The initial material embedded in Spurr's resine was cut at 4 microns and stained with toluidine blue. In the sections the following parameters were determined: Areas, number of cells in interphase, number of cells in mitosis, number of prophases, metaphases and anaphases-telophases. From these the corresponding indices were determined. After the slides had been arranged in coordinate axes, each slide was divided into three sectors and the data obtained on those sectors were filed in the corresponding part of the disk. The measurements and reconstructions were carried out by using a Kontron IBAS.

With the reconstruction we proceeded to divide the cup into nine sectors. Each sector is anterior, middle or posterior and at the same time it can be

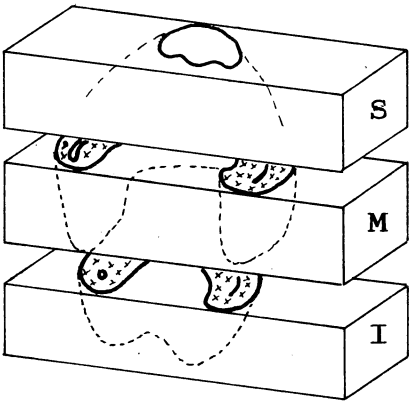

Figure 1.- Blocks obtained from the sum of the sectors situated at the same level.

upper, middle or lower.The sum of the sectors on the same level (figure 1) was called block (superior, middle or inferior).

RESULTS AND COMMENTS

From the data it is ascertained that the inferior block always gives greater values than those offered by the other zones, table 1. In the values of the table our attention is also drawn by the fact that there is a zone where there a decrease.

Table 1.- Values in the mitotic index for the inferior, middle and superior blocks.

	13-15 Stages		17-19 Stages		Total Mean
Inferior	$\bar{X}$	7.53	$\bar{X}$	7.18	7.35
	SD	3.89	SD	4.71	
Middle	$\bar{X}$	5.46	$\bar{X}$	5.32	5.39
	SD	4.35	SD	3.54	
Superior	$\bar{X}$	4.54	$\bar{X}$	6.32	5.43
	SD	3.52	SD	3.91	

In order to understand what these circumstances mean it is necessary to consider that we are dealing with indices, which is identical to saying that we are dealing with averages or percentages related to the total amount of cells. Thus we must also take into account that as the development goes on there is an increase of the numbers of differentiating neuroblasts and spongioblasts, which involves a decrease of the population in division and therefore it demands its corresponding decrease in the mitotic figures. But, in our study this is not the case.

Remember that an increase in the number of mitoses indicates a longer time of the cells undergoing mitosis; and also remember that the inferior block piles, inside itself, the greater number of mitoses.

This number shows differences specially when being compared with a region overlapped with the central part of the middle block (values of 3.97 and 4.95 for the 13th and 17th stages). In that inferior zone those higher values (longer mitosis) could indicate and also account for the failure of the development in the choroid fissure. On the other hand, considering the low values obtained in the middle or central zone we can ask ourselves about the relationsphip between those smaller values and the interesting differentiation that is taking place in this zone, where the fovea appear later.

The study shows, once more, the relationship between the cytological processes and the three-dimensional organization along the development.

REFERENCES

Abadía-Fenoll F, Calvente R, Ostos MV, Carmona R. Mitotic index in the optic cup of developing chicken. Anat Anz, Jena 1983; 153: 263.

Almendros A, Navascués J, Carmona R, Abadía-Fenoll F. Studies on the mitotic state in the development of the chick brain. Z Mikrosk Anat 1982; 96: 857-864.

Hamburger V, Hamilton HL. A series of normal stages in the development of the chick embryo. J. Morph 1951; 88: 47-92.

Langman J, Guerrant RL, Freeman BG. Behavior of neuroepithelial cells during closure of the neural tube. J Comp Neurol 1966; 127: 399-412.

Mann IC. On the development of the fissural and associated regions in the eye of the chick, with some observations on the mamal. J Anat 1921; 55: 113-118.

O'Rahilly R, Meyer DB. The early development of the eye in the chick Gallus domesticus (stages 8-25). Acta Anat 1959; 36: 20-58.

Silver J, Sidman R. A mechanism for the guidance and topographic patterning of retinal ganglion cell axons. J Comp Neurol 1980; 189: 101-111.